WHAT IS CLAIMED IS:

1. A sensor for optically sensing air borne acoustic waves from a remote source, comprising:

(a) means for producing mutually coherent optical sampling and reference beams, which may be combined to form a heterodyne or homodyne intermediate frequency carrier,

(b) optical means including an aperture at which the path of the sampling beam into the air is initiated, and after reflection is terminated, said aperture and the sampling beam cross-section before reflection being small in relation to the acoustic wavelengths of interest,

(c) light reflective means arranged in said path for reflecting significant sampling beam energy back via said aperture,

said sampling beam path being oriented with a substantial component parallel to the acoustic wavefronts of interest, so that the sampling beam is exposed to an acoustic wave induced density variation of like amplitude over a substantial portion of said path, said density variation producing a variation in the index of refraction, and thereupon phase modulation of the sampling beam in proportion to the accumulated variation in the index of refraction over said beam path,

(d) an optical detector including optical means for coherently combining said reflected sampling beam with said reference beam to form an electrical carrier, phase modulated as a result of said variation in the index of refracton and

(e) a phase detector coupled to the output of said optical detector for detecting the acoustic wave induced phase variation of said sampling beam and thereby recovering an electrical signal representative of the acoustic waves.

2. A sensor as set forth in Claim 1 wherein

said light reflective means is a specular, retro-reflector, adjusted to reflect said beam back via said aperture.

8. In combination,

A. a plurality of sensors for optically sensing air borne acoustic waves along the boundaries of an area, each sensor comprising:

(a) means for producing mutually coherent, optical sampling and reference beams, which may be combined to form a heterodyne or homodyne intermediate frequency carrier,

(b) optical means including an aperture at which the path of the sampling beam into the air is initiated, and after reflection is terminated, said

aperture and the sampling beam cross-section before reflection being small in relation to the acoustic wavelengths of interest,

(c) a specular, retro-reflector arranged in said path for reflecting the sampling beam energy back via said aperture,

(d) an optical detector including optical means for coherently combining said reflected sampling beam with said reference beam to form an electrical carrier, phase modulated as a result of said variation in the index of refracton,

(e) a phase detector coupled to the output of said optical detector for detecting the acoustic wave induced phase variation of said sampling beam and thereby producing an electrical signal representative of the acoustic waves; and wherein

B. each sensor is arranged so that the beam paths collectively form a closed polygon embracing said area,

each sampling beam path being oriented such that all acoustic sources along said beam path produce acoustic wavefronts tangential to said beam path, so that the sampling beam is exposed to an acoustic wave induced density variation of like amplitude over a

35 portion of said path, said density variation producing a variation in the index of refraction, and thereupon phase modulation of the sampling beam in proportion to the accumulated variation in the index of refraction over said beam path.